

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
REGION 1

ENVIRONMENTAL CONTAMINANTS PROGRAM
ON-REFUGE INVESTIGATIONS SUB-ACTIVITY

**NV - Contaminant Exposure of White Pelicans Nesting at Anaho Island
National Wildlife Refuge**

Project ID: 1N30
(filename: *Anaho.97*)

by

Stanley N. Wiemeyer
Resource Contaminant Specialist

John Miesner
Fish and Wildlife Biologist

and

Anita DeLong
Refuge Operations Specialist

for

Carlos H. Mendoza, State Supervisor
Reno, NV
June 27, 1996

II. INTRODUCTION

II.A. Background and Justification

Anaho Island National Wildlife Refuge (NWR) is located on Pyramid Lake, Nevada.

Pyramid Lake is a terminal lake fed by the Truckee River. Anaho Island NWR was established for the protection of colonial nesting waterbirds, primarily white pelicans (*Pelecanus erythrorhynchos*). More than 12,000 white pelicans used Anaho Island in 1995, with an estimated 6,000 nests. Other species of fish-eating birds nesting on the island include double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), black-crowned night-herons (*Nycticorax nycticorax*), snowy egrets (*Egretta thula*), California gulls (*Larus californicus*), and Caspian terns (*Sterna caspia*). White pelicans from Anaho Island have commonly foraged at Lahontan Reservoir, on the Carson River, and at wetlands in Lahontan Valley (Knopf and Kennedy 1980).

Limited data are available on residues of environmental contaminants in white pelicans nesting at Anaho Island. In 1988, 11 eggs contained a mean of 2.90 ppm mercury (range 1.40-4.59; dry weight) and 1.50 ppm selenium (range <0.54-2.9; dry weight), whereas livers of three white pelicans from the region (details on exact source, etc. lacking) contained 14.1-35.9 ppm mercury and 4.0-14.5 ppm selenium (dry weight). Mercury concentrations in some eggs approached the concentration (0.8 ppm wet weight) associated with adverse reproductive effects in mallards (*Anas platyrhynchos*; Heinz 1979); however, some birds, especially seabirds, may accumulate much higher levels with no obvious adverse effects. No data are available on organochlorine contamination of Anaho Island white pelicans. Eggshell weight, thickness, and thickness index of Nevada white pelicans in 1968 were significantly depressed from pre-DDT norms by 9, 8, and 12%, respectively (Anderson and Hickey 1972).

White pelicans that breed west of the Rocky Mountains migrate southward to southern California and the west coast of Mexico (Evans and Knopf 1993). DDT is still used in Mexico. White-faced ibis (*Plegadis chihi*) that breed at Stillwater National Wildlife Refuge at the terminus of the Carson River, Nevada, continued to produce eggs with thin shells in 1996, with the source of the contamination most likely being the wintering grounds in Mexico (Henny and Herron 1989; C.J. Henny, NBS, pers. comm). Therefore, white pelicans potentially could still be exposed to DDE, the metabolite of DDT that causes eggshell thinning, on its wintering grounds.

A portion of the white pelican population that nests on Anaho Island winters on, or uses as a migratory stop-over, Salton Sea in southern California. Organochlorine residues, especially DDE, were very high in resident fish-eating birds (black-crowned night-herons and great egrets, *Casmerodius albus*) at Salton Sea in 1985 (Ohlendorf and Marois 1990). Also, black-crowned night-herons breeding at Ruby Lake NWR, Nevada, (a relatively clean area) were exposed to DDE on their southern wintering grounds, that included the Imperial Valley around Salton Sea (Henny and Blus 1986). Selenium and boron also accumulated in tissues of migratory and resident birds using Imperial Valley and Salton Sea food sources (Setmire et al. 1993). Six white

pelicans collected at Salton Sea in 1991 had a mean of 15 ppm selenium (range 11-22; dry weight) in their livers, whereas carcasses contained a mean of 5 ppm DDE (range 1.3-35 ppm wet weight; D. Audet, pers. comm.). If one were to assume that egg DDE concentrations are about one-third of carcass concentrations (egg concentrations were one-half of carcass concentrations in captive American kestrels, [*Falco sparverius*] fed DDE; Wiemeyer et al. 1986), some white pelicans may be laying eggs with as much as 10 ppm DDE and certainly as much as 5 ppm. Data on the sensitivity of white pelicans to the reproductive effects of DDE were not found. However, total reproductive failure of brown pelicans (*Pelecanus occidentalis*) occurred when DDE concentrations exceeded 3.7 ppm (wet weight; Blus 1984).

Several studies of the distribution of environmental contaminants in the feeding range of Anaho Island white pelicans have been completed or are in progress. The Department of the Interior sponsored National Irrigation Water Quality Program (NIWQP) studies in the area of the Newlands Project in the lower Lahontan Valley to the southeast of Pyramid Lake (Hoffman et al. 1990; Lico 1992; Hallock and Hallock 1993; Hoffman 1994). Water for the Newlands Project is supplied by the Carson River and diversions from the Truckee River. Drainwater from the Newlands Project ultimately flows onto Stillwater NWR and to Carson Lake, a State managed area, important wetlands in Lahontan Valley. These studies have described the presence and transport of a variety of heavy metals and trace elements. Data on trace element concentrations for water, sediment, and a variety of biota are available for a number of Lahontan Valley wetlands from past studies. Environmental monitoring on four Lahontan Valley wetlands, with the collection of similar data, is ongoing through 1996 to provide a baseline for future remedial activities. Elevated concentrations of boron, mercury, and selenium were found in juvenile migratory birds. Stillwater NWR and Carson Lake are also used as dispersal areas for fledgling white pelicans from Anaho Island.

The Environmental Protection Agency (EPA) has declared several miles of the Carson River in Lyon and Churchill Counties of Nevada as a National Priorities List (NPL) site (Carson River Mercury Site) and is proceeding with limited mercury cleanup of upland sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Mercury contamination in the Carson River resulted from its use in the recovery of gold and silver from ore at mills along the Carson River and its tributaries near Virginia City, Nevada during the late 1800's. It is estimated that up to 7,500 tons of elemental mercury were lost from these operations. Much of the mercury was deposited directly into the Carson River and has been subsequently transported downstream into Lahontan Reservoir and wetlands of Lahontan Valley, including Stillwater NWR and Carson Lake.

Investigations at Lahontan Reservoir have shown mercury concentrations in fish exceed human health consumption guidelines and may also pose an unacceptable risk to fish and fish-eating birds. An EPA contractor collected blood and feathers from double-crested cormorants at Pyramid Lake and Lahontan Reservoir to determine mercury concentrations (S. Peterson, Ecology & Environment, Inc., pers. comm.). Average mercury concentrations (n = 7) for cormorants at Lahontan Reservoir were 17.07 and 105.11 µg/g (wet weight) for blood and

feathers, respectively. Average mercury concentrations ($n = 8$) in cormorants at Anaho Island, the background site for EPA's study, were 0.49 and 8.99 $\mu\text{g/g}$ (wet weight) for blood and feathers, respectively. The mercury concentrations in feathers of cormorants from Lahontan Reservoir exceed those found in raptorial birds in Europe in relation to its use as a seed dressing, when avian mortality and effects on reproduction were also noted (Berg et al. 1966; Borg et al. 1969; Westermarck et al. 1975). A sample ($n = 10$) of walleye (*Stizostedion vitreum*) from Lahontan Reservoir contained a mean of 6.14 ppm (wet weight) mercury, whereas a sample ($n = 17$) of Sacramento blackfish (*Orthodon microlepidotus*) contained a mean of 0.54 ppm mercury (wet weight). Samples of muscle of fish from Lahontan Reservoir collected in 1981 contained variable concentrations of mercury, ranging from 0.71 to 9.52 ppm (wet weight), with piscivores containing higher concentrations than omnivores (Cooper 1983). Mercury concentrations in fish from Lahontan Valley wetlands commonly exceeded 1 ppm (dry weight; Hoffman et al. 1990). Reproductive success of mallards fed a dry diet containing 0.5 ppm methylmercury was significantly depressed from that of controls. Therefore, potential dietary items of Anaho Island white pelicans are well above the concentration found to affect the reproduction of birds. Lahontan Reservoir and Lahontan Valley wetlands appear to be important sites of mercury exposure for Anaho Island white pelicans.

Trace elements in feathers are deposited during the period of active growth. Therefore, concentrations of elements in feathers provide information on a longer history of exposure as well as a different period of exposure than may be provided by concentrations in blood. Concentrations in feathers of young are indicative of local exposure (Burger 1996). Data on mercury, as well as some other elements, in feathers for various species and populations of birds is readily available in the literature.

Methylmercury in the diets of adult birds can cause lesions in the central and peripheral nervous systems (Borg et al. 1969, 1970; Fimreite and Karstad 1971; Pass et al. 1975). Brain lesions were found in mallard ducklings hatched from eggs of adults fed a dry diet containing 3 ppm methylmercury (Heinz and Locke 1976). Therefore, there is the potential for neurological effects to Anaho Island white pelicans or their young.

A major die-off of white pelicans (at least 360) occurred at Crowley Lake, California, in September 1989 (D.A. Jessup, California Department of Fish and Game, pers. comm.). Most were emaciated juveniles. Crowley Lake is located on the east side of the Sierra Nevada, about 30 miles south-south-west of Mono Lake, and is likely on the migratory route for Anaho Island white pelicans. The birds apparently had elevated concentrations of mercury (mean 20 ppm, extreme > 160 ppm; unknown if wet or dry weight basis; David A Jessup, State of California Department of Fish and Game); however, complete data have not been seen.

Pelicans have been shown to be sensitive to environmental contaminants. The contaminants of concern for the white pelicans breeding at Anaho Island, especially mercury and DDE, have the potential to adversely affect the hatchability of eggs, and mercury has the potential to adversely affect the survival of developing young.

II.B. Scientific Objectives

The first scientific objective of this study is to determine if various environmental contaminants are having an adverse effect on the reproductive success of white pelicans breeding at Anaho Island National Wildlife Refuge. This includes determining the type(s) of contaminants involved, the nature of the adverse effects (e.g., poor hatchability, reduced survival to fledging), and the manner in which the effect is manifested.

If contaminants are adversely impacting productivity of white pelicans nesting at Anaho Island, the second scientific objective of this study is to determine the sources of local contamination (e.g., feeding areas and species of fish).

II.C. Management Actions

If environmental contaminants are adversely impacting white pelicans at Anaho Island, the managers of Stillwater NWR, will be informed of likely sources of contaminant exposure to white pelicans both on and off refuge lands. Wetland manipulation strategies on refuge lands may be available to reduce contaminant exposure to white pelicans. This may include management of fish populations on refuge lands to increase the availability of pelican food sources with low contaminant burdens, thereby drawing pelicans away from more contaminated sites. Other strategies may also be available on refuge lands to reduce contaminant burdens in fish populations or to eliminate contaminated fish populations. Information will also be provided to other area programs, such as the Truckee-Carson Irrigation District and the EPA Remedial Project Manager of the Carson River Mercury Site (Superfund) so that consideration may be given to possible management options that could reduce contaminant exposure, especially mercury, to white pelicans.

III. METHODS

III.A. Data Collection and Analysis

Briefly, white pelican eggs, blood samples from two age classes of young, feathers from pre-fledged young, and food from pelicans and feeding areas will be collected from the Anaho Island area and a reference colony in Oregon. Samples will be analyzed for organochlorine pesticides and polychlorinated biphenyls (PCBs), and trace elements, especially mercury and selenium. Data on concentrations of environmental contaminants in these samples, and that from other studies in the area, will be evaluated to determine relationships between residues and productivity, and the sources and pathways of the contaminants.

Most or all visits into the nesting colony for sample collections will be conducted at night to prevent predation on eggs and small nestlings by California gulls. General information on the

stage of nesting activity and nest success in various portions of the nesting colony will be assessed by observations made from a bluff above the colony. These observations made with spotting scopes are not disruptive to the birds and should not adversely impact productivity. Three one- to two-week observation periods will be conducted throughout the period of reproduction, starting with egg-laying. Nests in a tract of the colony near the base of the bluff will be mapped and reproduction will be monitored. Collections of eggs and blood samples will not be made in this area so as not to interfere with reproductive outcome in this intensively studied area.

Thirty white pelican eggs will be collected at random at Anaho Island NWR. Collections may occur on more than one date to include both early and late nesters. Eggs will be collected late in incubation to allow for easier detection of developmental deformities and to avoid greater risks of abandonment if collections were conducted early in incubation. Data on contaminants in eggs will allow for the evaluation of contaminant exposure in newly arrived birds. One egg will be collected per nest containing more than one egg and nests will be marked. A sample of nests with no egg collections will be marked in the same manner as those where collections are made. Eggs will be analyzed for organochlorine pesticides, PCBs, and trace elements, including mercury. Size, weight, and volume of eggs will be recorded. Eggs will be opened with chemically clean instruments; embryos will be examined for gross abnormalities and stage of embryonic development will be recorded. Egg contents will be placed in chemically clean jars and frozen. Shell thickness and weight will be determined after the eggshells have air-dried for at least 30 days. Shell thickness, thickness index, and shell weight will be compared with the pre-DDT data of Anderson and Hickey (1972) for the western United States.

Productivity at each of the sampled nests will be determined on one or more follow-up visits to the colony before the young leave the nests. The sample egg technique (Blus 1984) will be used to relate contaminant concentrations in eggs to productivity at marked nests and to estimate critical levels of environmental contaminants that impact white pelican productivity. A 5 to 10 cc blood sample will be taken, using disposable heparinized syringes, from each of 25 nestlings during this visit to the colony. Much of the feeding activity of the adults at this stage should be occurring on Pyramid Lake (Knopf and Kennedy 1980) from relatively clean food sources, including the endangered cui-ui (*Chasmistes cujus*), which stages at the Truckee River delta of Pyramid Lake for a spawning run at this time.

After the pelican young leave the nest, Stillwater NWR staff enter the colony to band young for management purposes. Blood samples from an additional 25 young will be collected at this time, with sampling volumes and methods being similar to those given above. Body feathers will be clipped from a consistent site on each young with stainless steel scissors, placed in chemically clean jars, and later analyzed for mercury alone due to small sample sizes. Both blood and feathers will be collected from the same young. Up to 10 young sacrificed at this time (3 "normal" and 7 "debilitated") will be examined for lesions to the nervous system; blood (part of the 25 young listed above) and livers of these birds will be included for trace element analysis. Adult pelicans should be feeding at more distant sites at this time (Knopf and Kennedy 1980);

these may include areas contaminated with elements from irrigation drainwater and with mercury from the Carson River. Blood sample volumes will be recorded and samples will be preserved with formalin in the field according to the methods described by Wiemeyer et al. (1984). All blood samples will be placed in chemically clean containers and analyzed for trace elements, including mercury, using an ICP scan. If sample volumes are inadequate for a complete scan, priority will be given to analysis of mercury and selenium.

Food samples regurgitated by young (10 samples during each of two visits) will be collected for analysis during periods of blood sampling. Because there are a number of lakes where adult pelicans may feed, it is necessary to determine temporal use of lakes by these birds. Aerial waterfowl surveys of western Nevada wetlands, including areas where white pelicans feed, are conducted by the Nevada Division of Wildlife (NDOW) in March, May, and August. NDOW will count white pelicans on these flight surveys. These surveys will be supplemented with aerial surveys performed by Stillwater NWR personnel to locate and count white pelicans on feeding areas in April, June, and July. Additional information obtained from ground observations will be used to locate flocks of feeding pelicans. We will collect 20 samples of fish, representing the most likely food item, at feeding sites during periods of maximum use. Each fish sample will be a pooled sample of a single species. We will record length and weight of individual fish in the pooled samples. All food items will be placed on ice in the field, frozen upon return to the laboratory, and analyzed for trace elements. A subsample of 6 regurgitated samples (3 per visit to the colony) and 10 field-collected samples considered representative of the feeding sites will be analyzed for organochlorine pesticides and PCBs.

Up to 10 dead adults and 10 young, including dead young and live deformed young, will be collected as available. These are in addition to the 3 normal and 7 debilitated young to be sacrificed at the time of banding. Samples of adult muscle will be analyzed for organochlorines. Information on general condition and abnormalities, if any, of the birds will be recorded. Liver samples of adults and juveniles will be analyzed for trace elements. Fresh tissue samples from juveniles may also be saved for histopathological examination in relation to mercury exposure. Tissue samples for contaminant analysis will be removed with the use of chemically clean instruments, weighed, frozen, and placed in chemically clean jars. Small deformed young may be sent on wet ice to the National Wildlife Health Center for necropsy.

Six eggs, six samples of regurgitated food, and six blood samples from nestling pelicans both before and after they leave the nest, will be collected from a reference site at Malheur NWR or at Pelican Lake in the Warner Basin of Oregon for comparison with data from Anaho Island. There are no known local sources of environmental contaminant exposure for the pelican colony at Malheur NWR. Eggs will be analyzed for organochlorines and trace elements. Blood will be analyzed for trace elements. All food samples will be analyzed for trace elements and one-half (3) will be analyzed for organochlorines. Feathers, collected from older young, will be analyzed for mercury.

All samples for contaminant analysis will be submitted to the Patuxent Analytical Control Facility (PACF) or their approved contractor. Analytical quality assurance/quality control will be according to PACF (1990).

Data on trace element concentrations in water, sediment, and a variety of biota, including fish, for selected wetlands in Lahontan Valley, some of which may be used as feeding sites for white pelicans, will be available from past and ongoing NIWQP studies. Similar data, collected by a variety of researchers at Lahontan Reservoir, is also available. These data will supplement that collected in this study in evaluating sources and pathways of trace element exposure and developing management alternatives for reducing exposure to white pelicans.

A pathologist (Dr. L. Sileo) from the National Wildlife Health Center will travel to Reno, Nevada, and be present at the time when pelicans are sampled just prior to fledging. He will sacrifice the birds and remove appropriate neurological tissues for histopathological examination. He will provide a report of his findings.

Dr. Elwood Hill, who will be with the University of Nevada, Reno, will aid in blood collections. He will retain a portion of each blood sample for enzyme assays that will be indicators of mercury exposure and adverse effects. The enzyme to be analyzed will be determined following future work by Dr. Hill.

Dr. Edward C. Murphy, Professor of Zoology, University of Alaska, Fairbanks, will conduct observations of breeding pelicans at Anaho Island. A report of his findings will be provided.

III.B. Investigation Schedule

Field work will be conducted in the spring and summer of 1996, with sample submission in the fourth quarter of the Fiscal Year. Data analysis will begin shortly following the receipt of results of residue analyses; the actual timing is impossible to predict because of variable lag times in receiving analytical results. A draft final report will be submitted within six months of receipt of analytical results. A final report will be submitted within two months of receipt of reviewers comments on the draft report. The final report will be a Service in-house report that will be distributed to Service managers, EPA, the Truckee-Carson Irrigation District (operators of the Newlands Project), the Bureau of Reclamation, and the Nevada Division of Wildlife. A presentation at a scientific meeting and publication of results in a peer reviewed journal are also anticipated.

IV. RESULTS TO DATE

Egg collections at Anaho Island were completed in early May 1996. Fish collections and collections of blood from nestling pelicans have begun. Observations of nesting pelicans are on-

going. Shell thickness, shell weight, and thickness of 30 eggs from Anaho Island were about 5-6 percent below the pre-DDT norms, with about 10 percent of the eggs with ≥ 15 percent thinning. For 15 nests where one egg each was collected on 29 April 1996, 12 nests each produced a single nestling of about 2 weeks of age, whereas 14 of 15 nearby marked nests where no eggs were collected were successful and produced 24 nestlings. Production at nests where eggs were collected on 6 May 1996 was lower, with 9 of 15 nests (both with and without egg collections) each producing a single young. Nearly all eggs had viable embryos. One egg was collected from each of six nests at Malheur NWR, Oregon, on 28 May 1996. Muscle and liver samples have been collected from several white pelicans found dead in the Pyramid Lake and Stillwater NWR areas.

V. REFERENCES

- Anderson, D. W., and J. J. Hickey. 1972. Eggshell changes in certain North American birds. *Proceed. Internat. Ornithol. Congr.* 15:514-540.
- Berg, W., A. Johnels, B. Sjostrand, and T. Westermarck. 1966. Mercury content in feathers of Swedish birds from the past 100 years. *Oikos* 17:71-83.
- Borg, K., H. Wanntorp, K. Erne, and E. Hanko. 1969. Alkyl mercury poisoning in terrestrial Swedish wildlife. *Viltrevy* 6:301-379.
- Borg, K., K. Erne, E. Hanko, and H. Wanntorp. 1970. Experimental secondary methyl mercury poisoning in the goshawk (*Accipiter g. gentilis L.*). *Environ. Pollut.* 1:91-104.
- Blus, L. J. 1984. DDE in birds' eggs: Comparison of two methods for estimating critical levels. *Wilson Bull.* 96:268-276.
- Burger, J. 1996. Heavy metal and selenium levels in feathers of Franklin's gulls in interior North America. *Auk* 113:399-407.
- Cooper, J. J. 1983. Total mercury in fishes and selected biota in Lahontan Reservoir, Nevada: 1981. *Bull. Environ. Contam. Toxicol.* 31:9-17.
- Evans, R. M., and F. L. Knopf. 1993. American white pelican. *The Birds of North America* 57:1-21. A. Poole and F. Gill, eds. *The American Ornithologist's Union.*
- Fimreite, N., and L. Karstad. 1971. Effects of dietary methyl mercury on red-tailed hawks. *J. Wildl. Manage.* 35:293-300.
- Hallock, R. J., and L. L. Hallock. 1993. Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90. Part B. Effect on biota in Stillwater and Fernley Wildlife Management Areas and other nearby wetlands. U.S. Geological Survey Water-Resources Investigations Report 92-4024B. 84pp.
- Heinz, G. H. 1979. Methylmercury: Reproductive and behavioral effects on three generations of mallard ducks. *J. Wildl. Manage.* 43:394-401.
- Heinz, G. H., and L. N. Locke. 1976. Brain lesions in mallard ducklings from parents fed methylmercury. *Avian Dis.* 20:9-17.
- Henny, C. J., and L. J. Blus. 1986. Radiotelemetry locates wintering grounds of DDE-contaminated black-crowned night-herons. *Wildl. Soc. Bull.* 14:236-241.
- Henny, C. J., and G. B. Herron. 1989. DDE, selenium, mercury, and white-faced ibis

- reproduction at Carson Lake, Nevada. J. Wildl. Manage. 53:1032-1045.
- Hoffman, R. J. 1994. Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90. Part C. Summary of irrigation-drainage effects on water quality, bottom sediment, and biota. U.S. Geological Survey Water-Resources Investigations Report 92-4024C. 32pp.
- Hoffman, R. J., R. J. Hallock, T. G. Rowe, M. S. Lico, H. L. Burge, and S. P. Thompson. 1990. Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in and near Stillwater Wildlife Management Area, Churchill County, Nevada, 1986-87. U.S. Geological Survey Water-Resources Investigations Report 89-4105. 150 pp.
- Knopf, F. L., and J. L. Kennedy. 1980. Foraging sites of white pelicans nesting at Pyramid Lake, Nevada. Western Birds 11:175-180.
- Lico, M. S. 1992. Detailed study of irrigation drainage in an near wildlife management areas, west-central Nevada, 1987-90. Part A. Water quality, sediment composition, and hydrogeochemical processes in Stillwater and Fernley Wildlife Management Areas. U.S. Geological Survey Water-Resources Investigations Report 92-4024A. 65 pp.
- Ohlendorf, H. M., and K. C. Marois. 1990. Organochlorines and selenium in California night-heron and egret eggs. Environ. Monit. Assess. 15:91-104.
- Pass, D. A., P. B. Little, and L. A. Karstad. 1975. The pathology of subacute and chronic methyl mercury poisoning of the mallard duck (*Anas platyrhynchos*). J. Comp. Pathol. 85:7-21.
- Patuxent Analytical Control Facility. 1990. Reference manual: U.S. Fish and Wildlife Service, Patuxent Analytical Control Facility, Laurel, Maryland.
- Setmire, J. G., R. A. Schroeder, J. N. Densmore, S. L. Goodbred, D. J. Audet, and W. R. Radke. 1993. Detailed study of water quality, bottom sediment, and biota associated with irrigation drainage in the Salton Sea area, California, 1988-90. U. S. Geological Survey Water-Resources Investigations Report 93-4014. 102pp.
- Westermarck, T., T. Odsjo, and A. G. Johnels. 1975. Mercury content of bird feathers before and after Swedish ban on alkyl mercury in agriculture. Ambio 4:87-92.
- Wiemeyer, S. N., J. F. Moore, and B. M. Mulhern. 1984. Formalin preservation of avian blood for metal and DDE analysis. Bull. Environ. Contam. Toxicol. 33:525-532.
- Wiemeyer, S. N., R. D. Porter, G. L. Hensler, and J. R. Maestrelli. 1986. DDE, DDT + dieldrin: Residues in American kestrels and relations to reproduction. U. S. Fish and Wildlife Service, Fish and Wildlife Technical Report 6. 33 pp.

VI. ROLES, RESPONSIBILITIES, AND PARTNERSHIPS

VI.A. Roles and Responsibilities

The principal investigator will be responsible for the conduct of all portions of the study, including sample collection and preparation, as well as data interpretation and report generation. Dr. E. Murphy, University of Alaska, will conduct observations of nesting activity of white

pelicans at Anaho Island NWR. Staff at Stillwater NWR will assist with collections of eggs and blood of white pelicans at Anaho Island. They will also be responsible for the ongoing banding of juvenile pelicans and conducting aerial surveys of pelican feeding areas. Dr. Sileo will provide information on histopathology in neurological tissues of young pelicans in response to contaminant exposure. Dr. Hill will provide results of blood enzyme assays.

VI.B. Partnerships

Previous Partnerships

Dr. E. Murphy, University of Alaska, Fairbanks, conducted observations of nesting pelicans at Anaho Island for a total of 30 to 40 observation days in 1996. A report of his study findings will be provided to the Fish and Wildlife Service (Service). His salary will be paid by the University. The estimated value of his time, travel expenses, and field expenses is \$9,000. We will provide him with limited funds (\$4,000) to offset his travel expenses from Alaska and provide funds for field expenses. The net benefit to the Service is estimated at \$5,000. This effort should be considered an incoming partnership because a net contribution is being made to a Service effort.

Dr. E. Hill, University of Nevada, Reno, will provide data on blood enzyme assays that will be responsive to mercury exposure. Dr. Hill will provide his services (incoming partnership) at no cost to the Service. The estimated value of his services will be at least \$5,000.

Information on trace elements in water, sediment, detritus, invertebrates, and fish from the environmental monitoring program under phase IV of NIWQP will be available from four Lahontan Valley wetlands. These wetlands were sampled in 1994 and 1995, and are being sampled in 1996. These data will be directly applicable to the defining pathways of trace element transport and uptake in the food chain, ending in fish species that may be consumed by white pelicans. The value of this information in relation to this study is not easily estimated but certainly exceeds \$30,000.

Current Year Partnerships

None.

VII. BUDGET

VII.A. Previously Allocated Expenditures

FY 1996

Operational

\$ 67,150

Analytical (PACF + non-PACF)

\$67,603

VII.B. Funds Requested for FY 1997 (this proposal)

OPERATIONAL

Personnel Costs (salaries, benefits and overhead)		\$ <u>29,000</u>
Nevada State Office	\$27,000	
Stillwater NWR	2,000	

Travel		\$ <u>1,000</u>
--------	--	-----------------

Supplies		\$ <u>0</u>
----------	--	-------------

Equipment		\$ <u>0</u>
-----------	--	-------------

Other (specify):		\$ <u>0</u>
------------------	--	-------------

Sub-total for Operational Costs		\$ <u>30,000</u>
--	--	------------------

ANALYTICAL

PACF (direct or through contract)		\$ <u>0</u>
-----------------------------------	--	-------------

Non-PACF (necropsy, histopathology, etc.)		\$ <u>0</u>
---	--	-------------

Sub-total for Analytical		\$ <u>0</u>
---------------------------------	--	-------------

Total Funds Requested for FY 1997		\$ <u>30,000</u>
--	--	------------------

GRAND TOTAL OF PROJECT COSTS TO DATE		\$ <u>164,753</u>
---	--	-------------------

VII.C. Estimated Future Costs

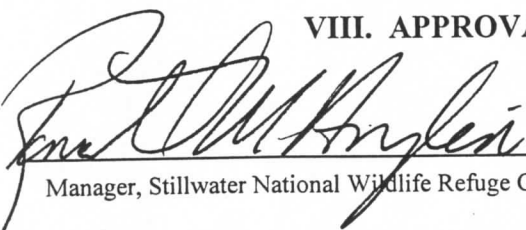
FY 1998

Operational		\$ <u>0</u>
-------------	--	-------------

Analytical (PACF + non-PACF)		\$ <u>0</u>
------------------------------	--	-------------

VIII. APPROVALS

Reviewed by:



Manager, Stillwater National Wildlife Refuge Complex

Date:

6/29/96

Submitted by:

Contaminant Specialist, Nevada State Office

Date:

Approved by:

Environmental Contaminants Coordinator

Date:

Approved by:

ARD, Interior Basin Ecoregion

Date:

1997 NATIONAL CRITERIA SCORE SHEET

TITLE: NV - Contaminant Exposure of White Pelicans Nesting at Anaho Island National Wildlife Refuge

PROJECT I.D.: 1N30 REGION: 1 RANK: _____ TARGET STATES: NV

Pass/Fail Criteria

The investigation proposal **DOES** ___ **DOES NOT** ___ pass the minimum required standards of the investigations sub-activity of the Environmental Contaminants Program.

_____ Proposal clearly identifies (1) an environmental problem related to anthropogenic contaminants and (2) site-specific management actions designed to resolve that problem. If not, explain:

_____ The proposal clearly identifies a level of biological impacts that must be investigated. Abiotic only sampling is clearly linked to an established threshold level of concern. If not, explain:

_____ At least two substantive peer reviews have been conducted and are attached. The proposal has been revised as appropriate. If not, explain:

_____ The required surnames have been obtained. If not, explain:

Ranking Criteria

For the above referenced proposal, determine a score for each of the following criteria in accordance with the criteria definitions described in Chapter 5 of the investigations manual. Identify the location of the text that supports the score. If you disagree with a score previously provided, explain why.

A. *Threats to resources are* **DOCUMENTED** (20 pts) or **SUSPECTED** (15 pts).

Field Office Supporting Text (**in bold**): Section II.A, ¶ 2-10 Score: 15

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

B. Management actions are **DIRECT** (15 pts) or **INDIRECT** (10 pts).

Field Office Supporting Text (**in bold**): Section II.C, ¶ 1 Score: 10

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

C.1. The highest organizational level of impacts being addressed is **POPULATION** (3 pts), **BIOTIC COMMUNITY** (5 pts), or **ECOSYSTEM** (7 pts).

Field Office Supporting Text (**in bold**): Section III.A, ¶ 1-10 Score: 7

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

C.2. The most severe type of biological impact addressed by the investigation is an **INDICATOR OF ADVERSE EFFECTS** (4 pts) or **ACTUAL ADVERSE EFFECTS** (7 pts).

Field Office Supporting Text (**in bold**): Section III.A, ¶ 3, 7 Score: 7

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

C.3. Source of the contaminant **IS** (3 pts) or **IS NOT** (0 pts) sufficiently addressed.

Field Office Supporting Text (**in bold**): Section III.A, ¶ 6, 10 Score: 3
Section II.A, ¶ 5

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

C.4. Pathway of the contaminant **IS (3 pts) or IS NOT (0 pts)** sufficiently addressed.

Field Office Supporting Text (**in bold**): Section III.A, ¶ 10 Score: 3

Regional Office Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

Reviewer Supporting Text: Section _____, ¶ _____ Score: _____
Explanation (if scores differ):

D. Final regional rank order is ____ of ____ . Score: _____

E1. Regional Performance Score Score: _____

E2. Current Year Partnerships ____ + Total Partnership Effort ____ Score: _____